HYDAC INTERNATIONAL

In-Tank Return Line Filters
RFM Series

Pressures to 145 psi • Flows to 224 gpm • Port Sizes 1", 1½" and 2½"

APPLICATION

- **HYDAC** RFM In-tank Return Line Filters are designed for use on hydraulic power units, machine tools, plastics injection molding equipment, mobile equipment, and hydraulic test equipment.
- These filters are designed to be directly mounted onto the oil reservoir for filtration of solids from hydraulic fluids.
- The lightweight and compact design makes it especially suitable to be used in mobile applications.
- The RFM 30-185 can be used as a combination filter, breather, and filler. This multifunction capability lowers the user's costs by eliminating components.

PRODUCT FEATURES

- The RFM 30 Filter is manufactured with polymide plastic housing and lid.
- The RFM 90/150/185/210/270 has an aluminum head with a polyamide screw-in lid.
- Models 330, 500, 661, and 851 have filter heads and bolt-on lids both made of aluminum.
- Models 75-270 the filter bowl also serves as a contamination basket.
- Models 30, 330, 500, 661, and 851 have filter elements equipped with separate, reusable contamination baskets.
- Cavities for clogging indicators are standard.

FILTER ELEMENTS

HYDAC RFM Filters are available with disposable Betamicron® (BN3HC) elements having 250 psid collapse pressure and absolute ratings of 3, 5, 10, and 20 micron.

HYDAC RFM Filters are also available with cleanable wire screen (W/HC) elements having a 250 psid collapse pressure and nominal ratings of 25, 74, and 149 micron.

RFM In-tank Return Line Filters

For applications which do not require fine filtration, *disposable* **HYDAC** (P/HC) polyester elements may be selected. Polyester elements have 145 psid collapse pressure and nominal ratings of 10 and 20 micron.

Aquamicron (AM) elements are available for applications specifically requiring water removal. These elements have a 40 micron absolute rating and a 145 psid collapse pressure. Betamicron Aquamicron (BN/AM) Combination Elements are available for applications in which control of significant levels of water and dirt ingression, by the same filter is desired. These combination elements are available in 3µm and 10µm absolute ratings and they remove a large amount of water from the system.

All filter media is supported to achieve flow fatigue resistance.

Proper support of the filter media also provides high Beta Ratio values (particle removal efficiency) even at high differential pressures. The efficiency of many competitive elements drastically deteriorates as the element clogs and differential pressure increases over the life of the element.

High quality epoxy adhesive is used to bind the end caps to the media and to bond the seam of the media.

All elements available for **HYDAC** RFM filters have the bypass valve built into the filter element. As a result, a new bypass valve is provided each time the element is changed, making it less likely that a bypass valve will stick open, jam, or fail through fatigue.

Model Code: RFM Filter Assembly

RFM BN/HC 330 B F F 3 D 1 . X / 12 - V - L24

Filter Type
RFM = In-Tank Return Line Filter

Filter Media
BN/HC = Betamicron® (BN3HC)
BN/AM = Betamicron® Aquamicron®
P/HC = Polyester
AM = Aquamicron®
(Disposable)
W/HC = Wire Screen (Cleanable)

Size and Material Head/Bowl
30 = PA6
75, 90, 150, 165, 185, 500, 661, 851 = Al/PA
210, 270 = AL/ST

Working Pressure
B = 145 psid (10 bar)

Optional Second Inlet Connection
F = G 1 1/2 (SAE-24)*(sizes 330 & 550 only)*
K = SAE DN 40 *(sizes 330 & 500 only)*
M = SAE DN 65 *(sizes 651 & 851 only)*
V = 2 x G 1 (SAE 16)*(sizes 210 & 270 only)*

Inlet Connection/Port Size (1 Inlet)
B = G 1/2 (SAE-8) *(size 30 only)*
C = G 3/4 (SAE-12) *(sizes 90 & 150 only)*
D = G 1 (SAE-16) *(sizes 75, 165 & 185 only)*
F = G 1 1/2 (SAE-24) *(sizes 210, 270, 330, & 500 only)*
K = SAE DN 40 *(sizes 330 & 500 only)*
M = SAE DN 65 *(sizes 651 & 851 only)*
Z = Customer Specific

Filtration Rating *(microns)*

3 µm, 5 µm, 10 µm, 20 µm	Betamicron (BN3HC)	Absolute Filtration Rating	$ß_x \geq 200$
3 µm, 10 µm	Betamicron Aquamicron (BN/AM)(Available in 330 & 660 Only)	Absolute Filtration Rating and Water Removal	$ß_x \geq 200$
40 µm	(AM)(Available in 330 & 660 Only)	Water Removal only	$ß_{40} > 100$
10 µm, 20 µm	Polyester (P/HC)	Nominal Filtration Rating	
25 µm, 74 µm, 149 µm	Wire Screen (W/HC)	Nominal Filtration Rating	

Type of Clogging Indicator
W = No Clogging Indicator, Port Not Machined *(sizes 75, 90, 150, 165, & 185)*
A = No Clogging Indicator, Port Machined & Plugged
B = Visual *(pop-up)* Clogging Indicator *(automatic reset) (sizes 330-851)*
BM = Visual *(pop-up)* Clogging Indicator *(manual reset) (sizes 75, 165, & 185)*
C = Electrical
D = Electrical/Visual *(lamp)* Clogging Indicator
E = Color-Coded Pressure Gauge *(also Type ES)*
F = Pressure Switch *(42 volt max.)*
H = Electrical

Type Number
0 = no indicator ports
1-X = see page 5 for clogging indicator positions

Modification Number

Inlet Port Configuration
3 = NPT *(RFM 30 only)*
12 = SAE Straight Thread O-Ring Boss Ports *(RFM 30-500)*
16 = SAE Code 61 Flange *(sizes 330-851)*

Seals
(omit) = Nitrile *(NBR) (standard)*
V = Fluoro Rubber *(FKM)*

Supplementary
L... = Lamp with respective voltage (24V, 48V, 110V, 220V) (D-Type Clogging Indicators Only)
LED = 2 Light Diodes up to 24 Volt (D-Type Clogging Indicators Only)
G = Thread in Outlet from size 330
T = Filter Breather *(RFM 30, 75, 90, 150, 165, & 185 only)*
B6 = Bypass 87 psid (6 bar)
KB = No Bypass
DTxx = Down tube (xx length in inches) (please contact factory)
DSxx = Dip stick (xx length in inches) (please contact factory)
SO 103H = Modification of BN3HC Elements for Phosphate Esters

*Model Codes containing **RED** are non-stock items – Contact **HYDAC** for availability*

Model Code: Return Line Filter Elements

0030 R 003 BN3HC / __ - __ __

Element Size

	Housing
0030	30
0075	75
0090	90
0150	150
0165	165
0185	185
0210	210
0270	270
0330	330
0500	500
0660	661
0850	851

Return Line Elements

Filtration Rating in Microns

003 = 3 µm 005 = 5 µm 010 = 10 µm 020 = 20 µm	Betamicron® Low Collapse (BN3HC)	$ß_x \geq 200$	Nominal Filtration Rating	
003 = 3 µm 010 = 10 µm	Betamicron Aquamicron (BN/AM)(Available in 330/660 Only)	$ß_x \geq 200$		
040 = 40 µm	Aquamicron (AM) (Available in 330 & 660 Only)	$ß_{40} > 100$		
010 = 10 µm 020 = 20 µm	Polyester (P/HC)			
025 = 25 µm 074 = 74 µm 149 = 149 µm	Wire Screen (W/HC)			

Type of Media

BN3HC =	Betamicron®	Disposable
BN/AM =	Betamicron Aquamicron	
P/HC =	Polyester	
AM =	Aquamicron	
W/HC =	Wire Screen	Cleanable

Seals

(omit) =	Nitrile *(NBR) (standard)*
V =	Fluoro Rubber *(FKM)*
EPR =	Ethylene Propylene *(EPDM)*

Bypass Valve

(omit) =	43 psid/3 bar - Return Line *(standard)*
KB =	No Bypass - Flushing System
B6 =	87 psid (6 bar)

Supplementary

SO 103H= Modification of BN3HC Elements for Phosphate Esters

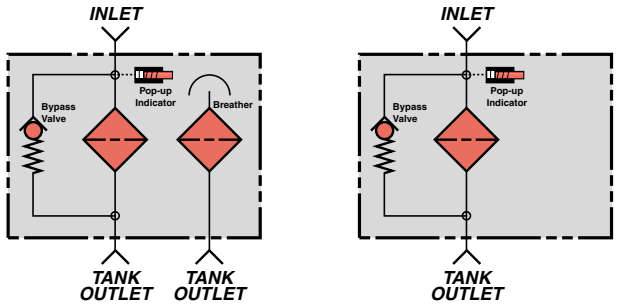
*Model Codes Containing **Red** are non-stock items — Minimum Order Quantities may apply*
*Contact **HYDAC** for information and availability*

RFM 75/165/185
Breather Replacement Element

Model Code	For Filter Type	P/N
0165L003P	RFM 75/165/185	00315047
0090L010P	RFM 90/150	02074782

Engineering Data:

Design	In-tank Return Line Filter
Mounting Method	4 Mounting Holes in Filter Housing
Direction of Flow	**Inlet:** Side of Housing **Outlet:** Bottom of Housing
Housing Pressure Ratings	**Operating:** 145 psi (10 bar) **Proof:** 218 psi (15 bar) **Fatigue:** Contact HYDAC Office **Burst:** Contact HYDAC Office
Element Collapse	**Standard Elements:** BN3HC: 250 psid (17 bar) W/HC: 250 psid (17 bar) P/HC: 145 psid (10 bar) BN/AM: 145 psid (10 bar) AM: 145 psid (10 bar)
Fluid Temperature Range	**Nitrile Seals:** -22°F - 250°F Please contact HYDAC for information on extreme low temperature (below -22°F) applications.
Fluid Compatibility (ISO 2943)	Compatible with all petroleum oils and synthetic fluids rated for use with Nitrile and Fluoro Rubber seals. Contact **HYDAC** office for more information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.
Element Flow Fatigue Resistance	Filter medium is supported to achieve flow fatigue resistance. Contact **HYDAC** office for information.
Trip Pressure of Static Indicator	P = 29 psi (2 bar) - 10% *(standard)*
Cracking Pressure of Bypass Valve	ΔP = 43 psid (3 bar) + 10% *(standard)*
	RFM 30, 75, 90, 150, 165, & 185 RFM 210, 270, 330, 550, 661, & 851



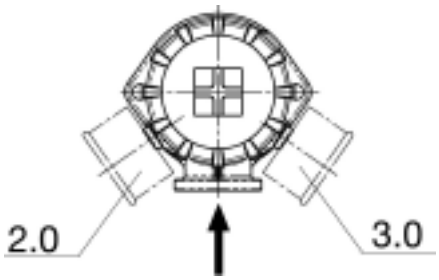
Above subject to change to technical modifications.

Weights		
Model	with Element	
	lbs.	kg.
RFM 75	2.0	0.9
RFM 90	1.2	0.5
RFM 150	1.7	0.8
RFM 165	2.4	1.1
RFM 185	2.5	1.1
RFM 210	6.8	3.1
RFM 270	9.5	4.3
RFM 330	8.6	3.9
RFM 500	9.9	4.5
RFM 661	19.8	9.0
RFM 851	23.1	10.5

Element Size	Max. Recommended Flow
30	5 gpm
75	27 gpm
90	26 gpm
150	32 gpm
165	44 gpm
185	52 gpm
210	78 gpm
270	91 gpm
330	110 gpm
500	131 gpm
660	235 gpm
850	255 gpm

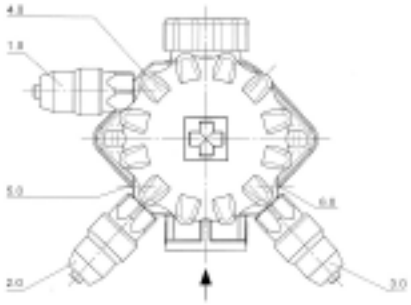
Clogging Indicator Locations:

RFM 90 / 150



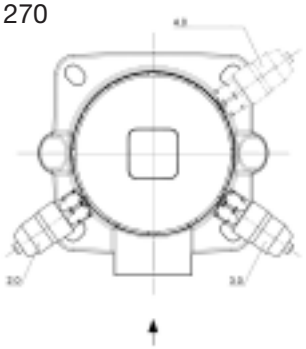
Type No.	Location of Clogging Indicator	Indicator Model
2.X	Clogging Indicator left front 45° to Inlet	VMF...
3.X	Clogging Indicator right front 45° to Inlet	VMF...

RFM 75 / 165 / 185



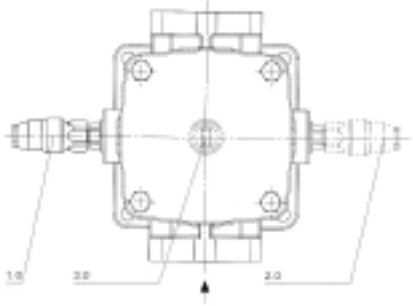
Type No.	Location of Clogging Indicator	Indicator Model
1.X	Clogging Indicator left back 90° to Inlet	VMF...
2.X	Clogging Indicator left front 45° to Inlet	VMF...
3.X	Clogging Indicator right front 45° to Inlet	VMF...

RFM 210 / 270



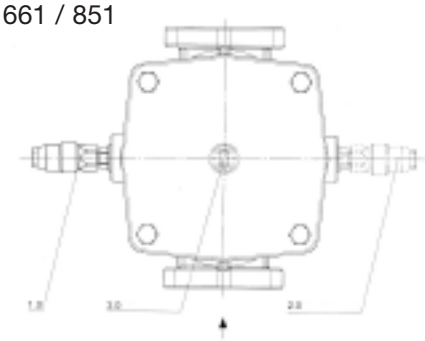
Type No.	Location of Clogging Indicator	Indicator Model
2.X	Clogging Indicator left front 45° to Inlet	VMF...
3.X	Clogging Indicator right front 45° to Inlet	VMF...

RFM 330 / 500



Type No.	Location of Clogging Indicator	Indicator Model
1.X	Clogging Indicator left 90° to Inlet	VR...

RFM 661 / 851



Type No.	Location of Clogging Indicator	Indicator Model
1.X	Clogging Indicator left 90° to Inlet	VR...

Filtration Efficiency

Multi-Pass Filtration Efficiency Ratings to ISO 4572 for Betamicron® Elements

Betamicron® Element	Absolute Element Rating	Terminal ΔP Across Filter Element
003BN3HC	$ß_3 \geq 200$	72 psi
005BN3HC	$ß_5 \geq 200$	72 psi
010BN3HC	$ß_{10} \geq 200$	72 psi
020BN3HC	$ß_{20} \geq 200$	72 psi

Filter Sizing Calculations

ΔP Assembly = ΔP Housing + ΔP Element

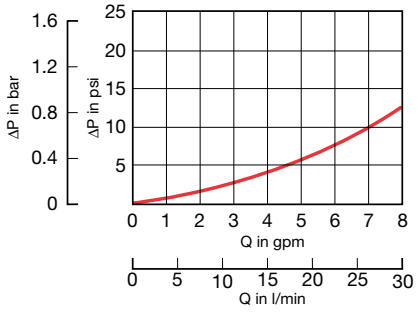
Housing Curves

The housing curve is based on test results using mineral oil with specific gravity of 0.86.
Differential pressure increases in proportion to the specific gravity of fluid used in the application.

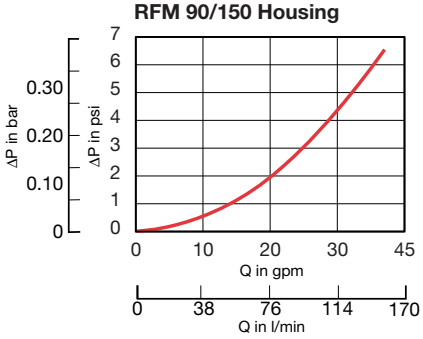
$$\Delta P \text{ Housing} = \Delta P \text{ Chart} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

RFM Filter Housing Curves

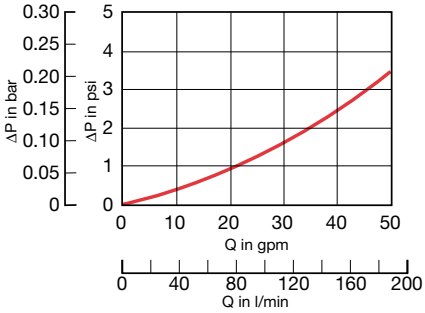
RFM 30 Housing



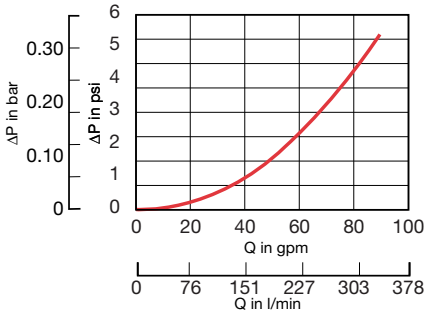
RFM 90/150 Housing



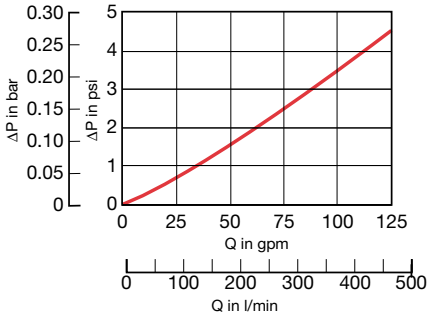
RFM 75/165/185 Housing



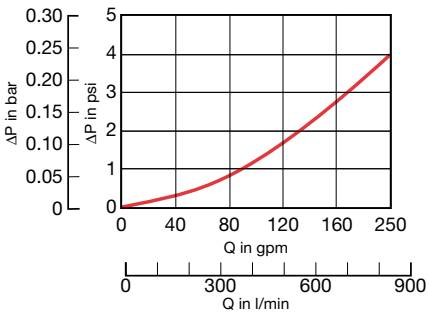
RFM 210 / 270 Housing



RFM 330/500 Housing



RFM 661/851Housing



Element ΔP Calculations

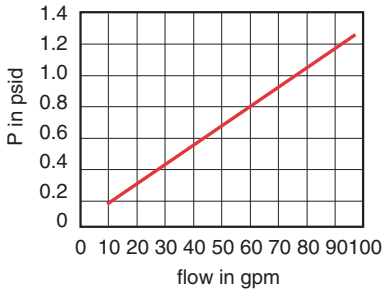
The element curves tables are based on test results using mineral oil with a kinematic viscosity of 141 SUS and a specific gravity of 0.86. The differential pressure across the element changes proportionally according to the viscosity and specific gravity.

Polyester (P/HC) and Wire Screen (W/HC) Elements

$$\Delta P \text{ Element} = \Delta P \text{ Curve} \times \frac{\text{Actual Viscosity}}{141} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Element (K) Flow Factors for Filter Sizing ...R...P/HC psi/gpm		
Size	10µm	20µm
0030	0.18278	0.09166
0075	0.07081	0.03568
0165	0.03348	0.01647
0330	0.01647	0.00823
0500	0.01098	0.00549
0660	0.00823	0.00329
0850	0.00659	0.00329

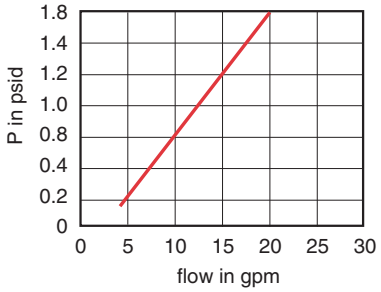
RFM 75/165/185 Air Breather



Element (K) Flow Factors for Filter Sizing ...R...W/HC psi/gpm	
Size	25, 50, 100, 200µm
0030	0.1098
0075	0.0428
0165	0.01976
0330	0.00988
0500	0.00659
0660	0.00494
0850	0.00384

Other sizes on request.

RFM 90/150 Air Breather



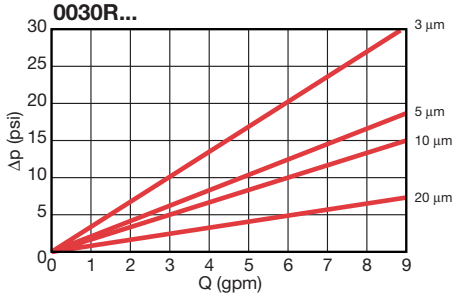
R...BN3HC Betamicron® 3 Plus Elements:

$$\Delta P \text{ Element} = \underset{\textit{(From Tables Below)}}{\text{Element (K) Flow Factor}} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

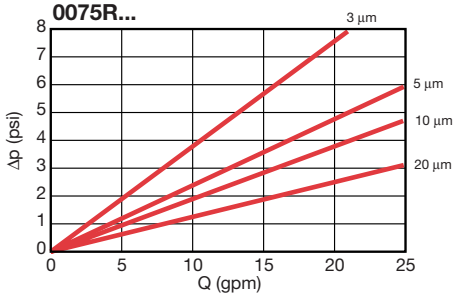
Element (K) Flow Factors for Filter Sizing ...R...BN/AM psi/gpm		
Size	3µm	10µm
0330	0.47746	0.16464
0660	0.19206	0.06586

R...BN3HC Betamicron® 3 Plus Elements:

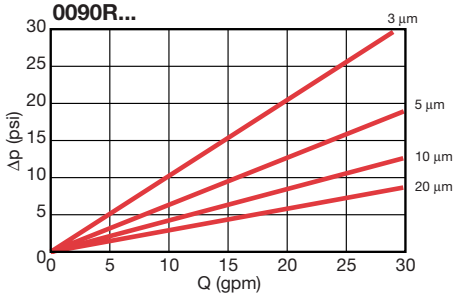
0030R...



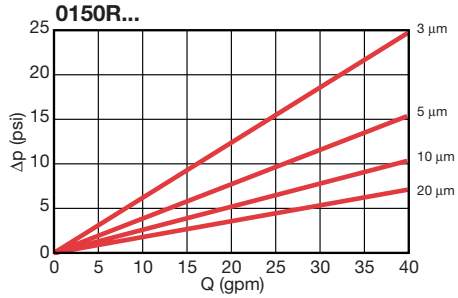
0075R...



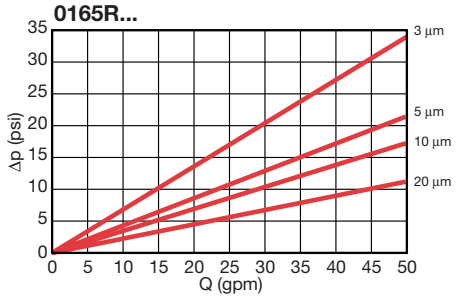
0090R...



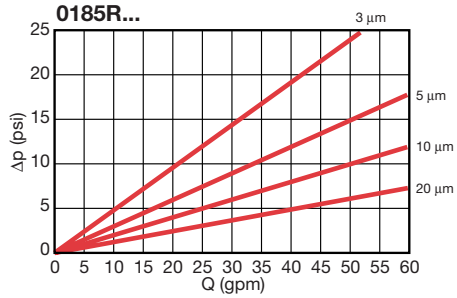
0150R...



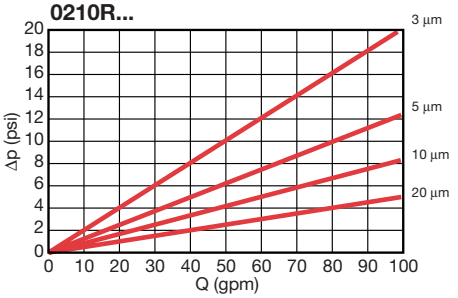
0165R...



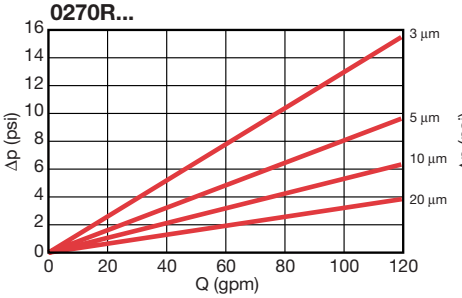
0185R...



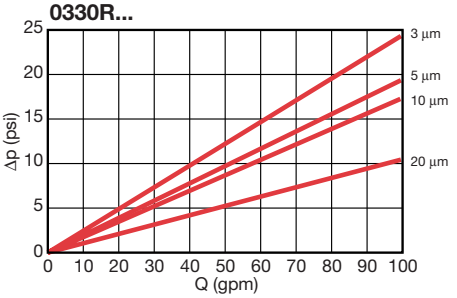
0210R...



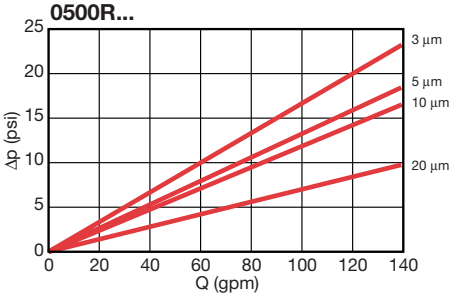
0270R...



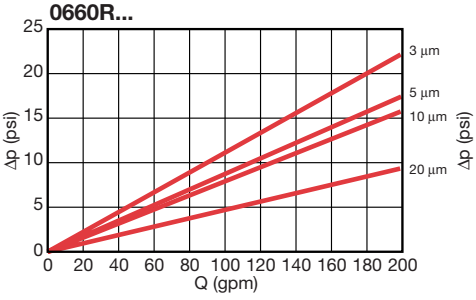
0330R...



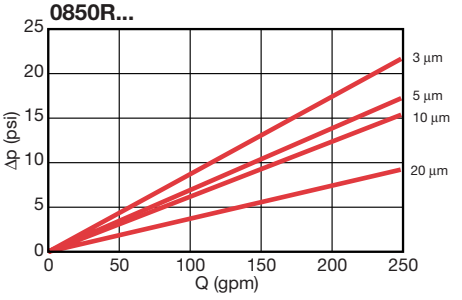
0500R...



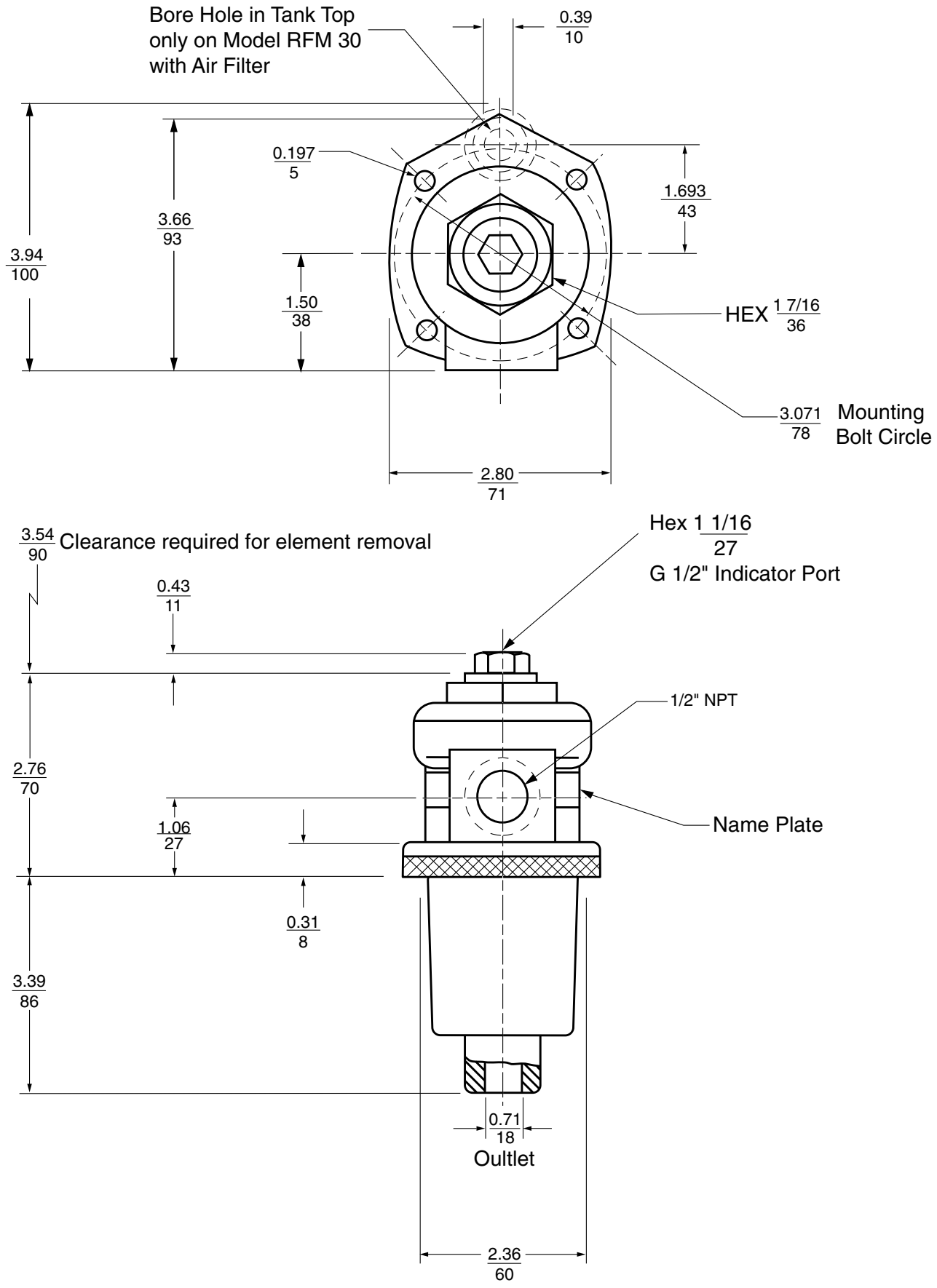
0660R...



0850R...

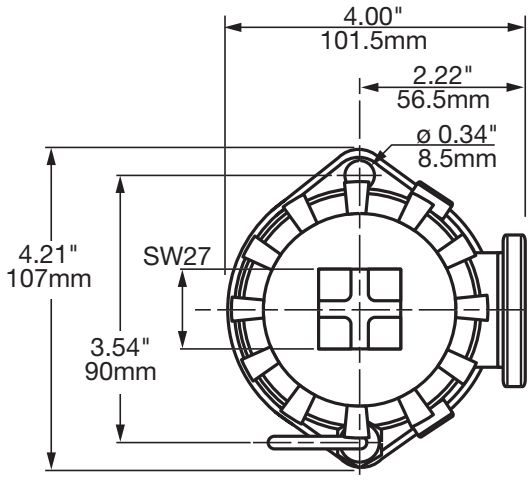


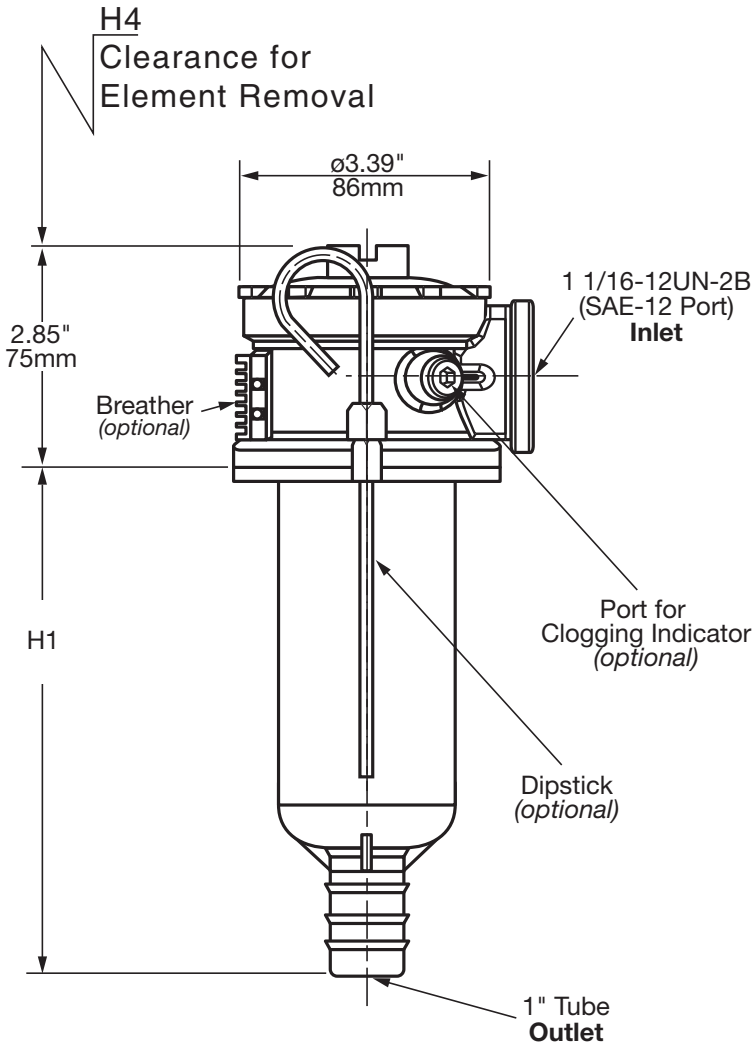
Dimensions: RFM 30

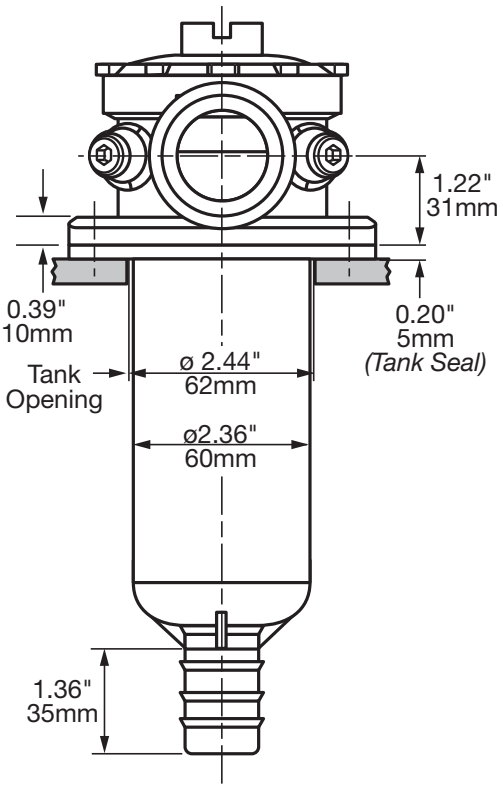


Dimensions in Inches/Millimeters
Dimensions are for general information only. Due to constant development and updating of details, we ask that all critical dimensions be verified by requesting a certified print.

Dimensions: RFM 90 / 150



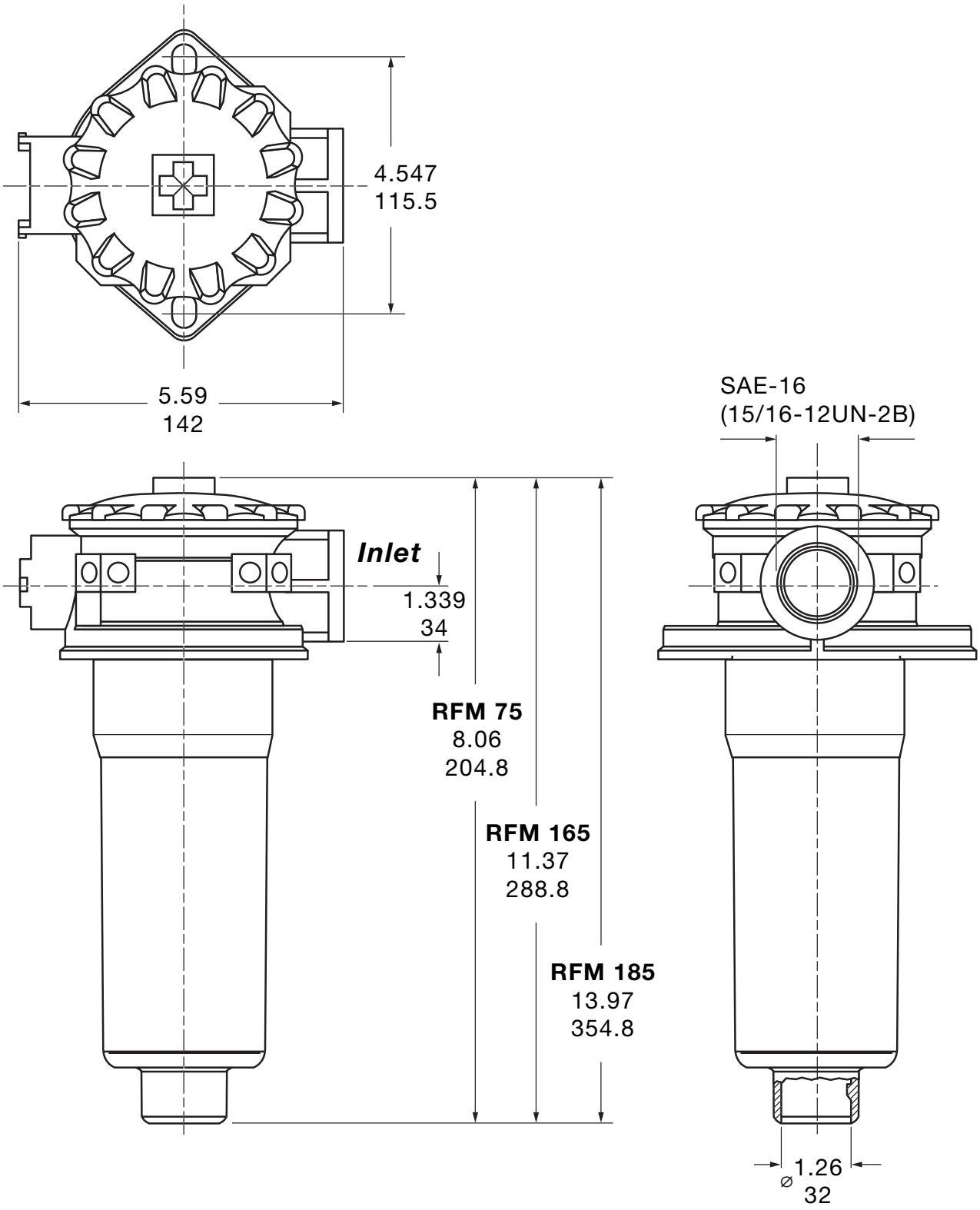




Model	H1	H4
90	6.73 171	7.87 200
100	10.0 254	11.02 280

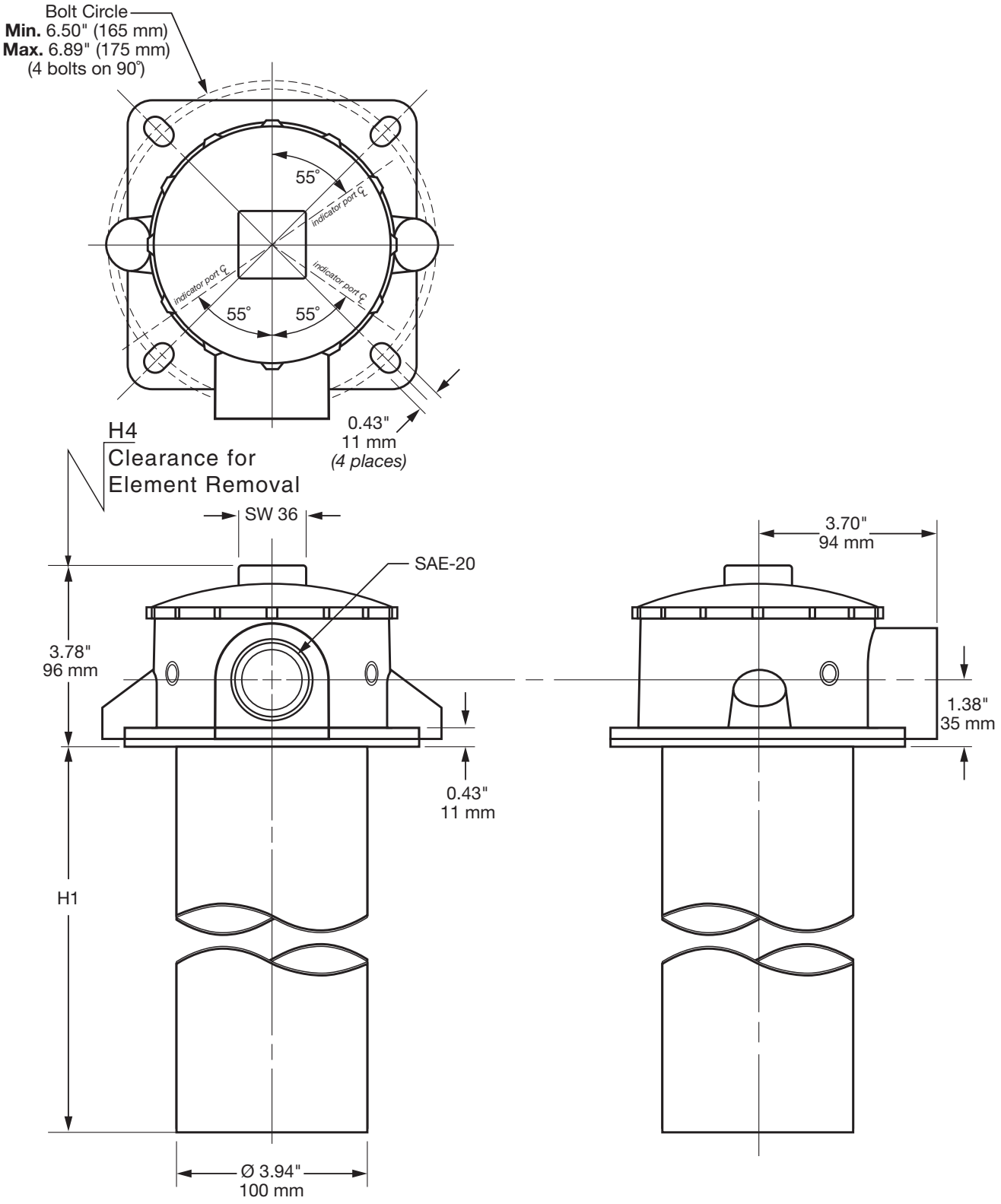
Dimensions in Inches/Millimeters
Dimensions are for general information only. Due to constant development and updating of details, we ask that all critical dimensions be verified by requesting a certified print.

Dimensions: RFM 75 / 165 / 185



Dimensions in Inches/Millimeters
Dimensions are for general information only. Due to constant development and updating of details, we ask that all critical dimensions be verified by requesting a certified print.

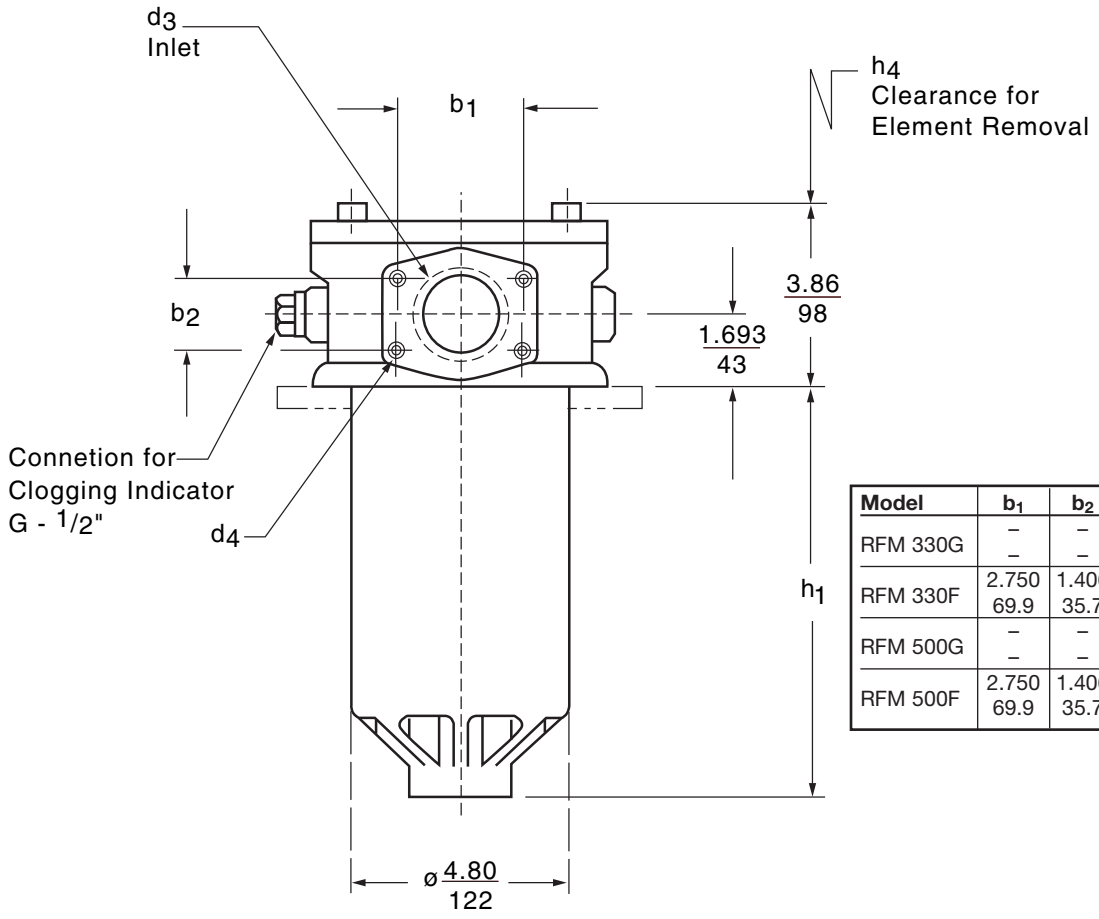
Dimensions: RFM 210 / 270



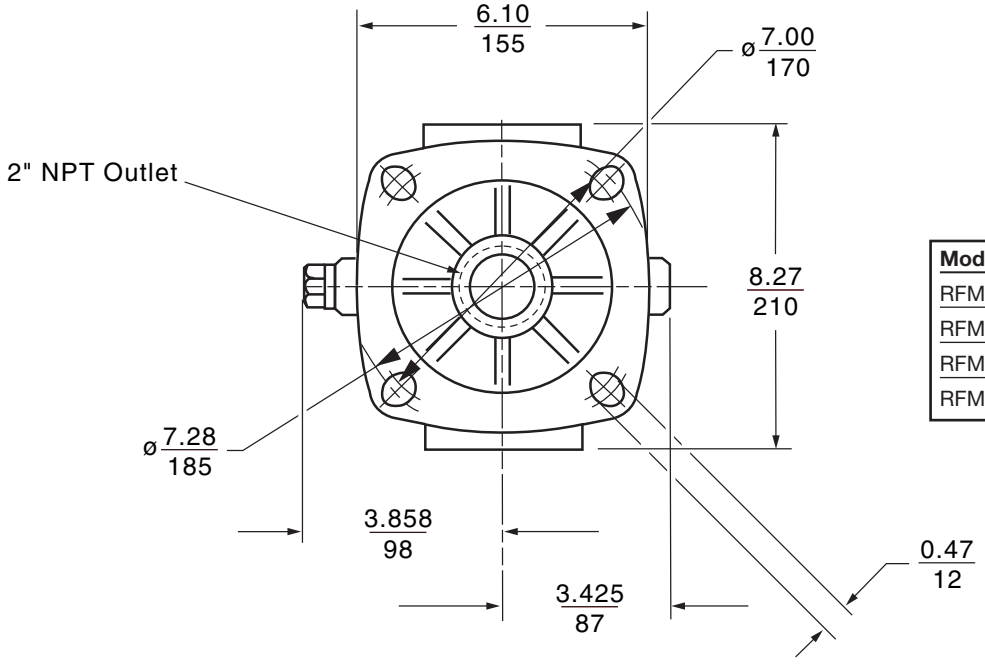
Model	H1	H4
210	9.92 252	11.81 300
270	15.12 384	16.93 430

Dimensions in Inches/Millimeters
Dimensions are for general information only. Due to constant development and updating of details, we ask that all critical dimensions be verified by requesting a certified print.

Dimensions: RFM 330 / 500



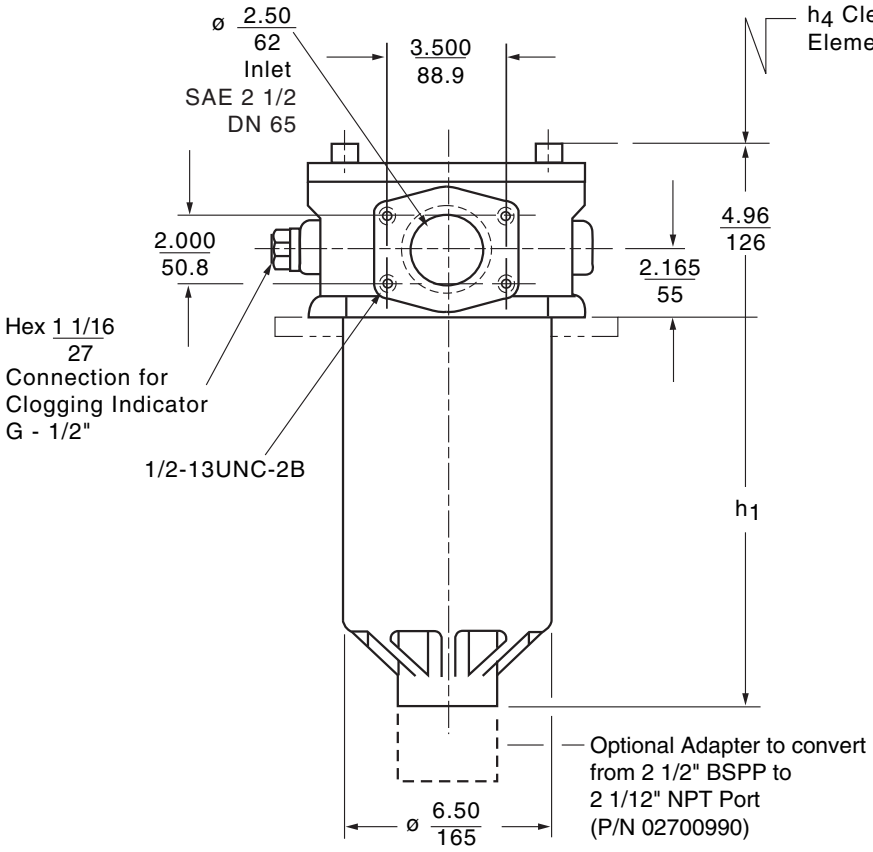
Model	b_1	b_2	d_3
RFM 330G	– –	– –	SAE-24 ($1^7/_8$-12UN-2B)
RFM 330F	2.750 69.9	1.406 35.7	SAE 1 1/2 DN 40
RFM 500G	– –	– –	SAE-24 ($1^7/_8$-12UN-2B)
RFM 500F	2.750 69.9	1.406 35.7	SAE 1 1/2 DN 40

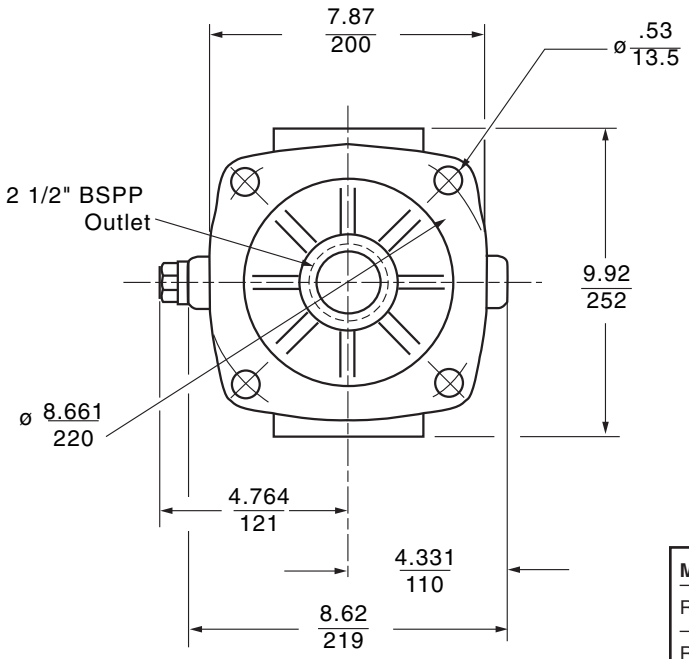


Model	d_4	h_1	h_4
RFM 330G	–	6.77	10.43
RFM 330F	1/2-13UNC-2B	172	265
RFM 500G	–	9.96	11.22
RFM 500F	1/2-13UNC-2B	253	285

Dimensions in Inches/Millimeters
Dimensions are for general information only. Due to constant development and updating of details, we ask that all critical dimensions be verified by requesting a certified print.

Dimensions: RFM 661/851





Model	h1	h4
RFM 661F	11.81 300	13.39 340
RFM 851F	15.00 381	16.54 420

Dimensions in Inches/Millimeters
Dimensions are for general information only. Due to constant development and updating of details, we ask that all critical dimensions be verified by requesting a certified print.

HYDAC TECHNOLOGY CORPORATION
2260 City Line Road • Bethlehem, PA 18017
Phone (610) 266-0100 • Fax (610) 264-3540
www.hydacusa.com • powerup@hydacusa.com